

July 19, 2006

MEMORANDUM – Draft

TO: Jim Johnston, PE; DEQ Idaho Falls Regional Office Administrator.
Greg Eager, PE; DEQ Idaho Falls Regional Office Engineering Manager.

FROM: Charlie Mazzone; DEQ Idaho Falls Regional Office Water Quality Engineer.

SUBJECT: Permit Renewal Staff Analysis: City of Menan Wastewater Treatment and Reuse Facility; LA-000066-02.

1.0 Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400.04 *Application Processing Procedure – Contents of the Staff Analysis* for issuing wastewater reuse permits. Specifically, this staff analysis shall briefly state the principal facts and the significant questions considered in preparing the draft permit conditions, and a summary of the basis for the draft conditions with references to applicable requirements and supporting materials.

2.0 Process Description

The Menan wastewater treatment facility provides primary and secondary lagoon treatment of wastewater, wastewater storage, disinfection, and land application of wastewater to 44.4 acres of crops. Cells (lagoons) A and B are aerated, and Cells (lagoons) 2, 3, and 4 are facultative polishing and winter storage lagoons. The lagoons are normally operated in a series connection, but valves are arranged to provide all possible configurations for wastewater movement. Class D wastewater effluent (IDAPA 58.01.17.600.07 et. seq.: *Specific Permit Conditions – Direct Use of Municipal Reclaimed Wastewater*) is chlorine disinfected to a minimum of 230 organisms per 100 mL, then slow infiltration land applied during the growing season. Wastewater is applied to three fields (units) of 19, 4, and 21.4 acres, for a total of 44.4 irrigated acres. The 21.4 acre field is a facility expansion approved with this renewed permit. Three wheel lines irrigate the 19 acre field, two hand lines irrigate the 4 acre field, and three wheel lines will irrigate the new 21.4 acre field.

Table 2.1 Lagoon Data

Lagoon	Description	Acreage ¹	Depth (feet)	Volume ¹ (gallons)	Storage (gallons)	Detention time ² (days)
Cell A	Part time complete mix aeration	0.70	8	1,825,000		
Cell B	Part time complete mix aeration	0.75	8	1,955,000		
Cell 1	Facultative / storage	2.3	3	1,818,000	1,818,000	14.5
Cell 2	Facultative / storage	2.7	5	3,796,000	3,796,000	17.6
Cell 3	Facultative / storage	4.1	5	5,816,000	5,816,000	27.0
Total				15,210,000	11,430,000	59.1

1: acreage and volume at maximum depth.

2: detention time at maximum depth and 0.23 million gallons per day. Evaporation and percolation are ignored.

3.0 Summary of Events

Events relevant to this permitting action are summarized below.

1979: the Wastewater Treatment Facility Planning Study is completed.

1986: the Operation and Maintenance Manual is completed.

September 1987: a facility inspection finds that the influent flow meter is not functioning, the “sewer line clearing rod system” [sic] is inadequate, vegetation needs to be cleared, and cites minor maintenance issues (gate valve lubrication).

February 1989: after a brief “walk around” inspection, land application or surface water discharge is recommended when the inspector notices only one foot of freeboard in the last lagoon.

February 1990: the first permit is issued.

February 1995: the first permit expires.

December 1997: a permit renewal application is submitted.

September 2003: the facility submits an application for additional land application acreage.

March 2006: an inspection is conducted for permitting purposes.

July 2006: the draft permit is issued for comment.

4.0 Site Characterization

4.1 Climate

Menan is 4795 feet in altitude, and is characterized by:

- 12 inches to 14 inches of annual precipitation;
- a 125 day growing season (Idaho Falls – Pocatello area data);
- 45 inches to 50 inches mean annual (Class A) pan evaporation;
- a 10 mph (mean) southwest prevailing wind; and,
- 9/10 inch of precipitation for the 5 year, 6 hour event frequency.

4.2 Soils

The facility contains Hayeston sandy loam and Heiseton loam soil types. Hayeston sandy loam is a deep, well drained alluvium, sloped 0 to 1 percent, with moderately rapid permeability, rooting depth to 60 inches or more, low or moderate water capacity, slow surface runoff, and low erosion hazard.

Heiseton loam is a deep, moderately well drained alluvium, sloped 0 to 1 percent, with moderately rapid permeability, rooting to 60 inches or more, high water capacity, very slow runoff, and slight erosion hazard.

4.3 Ground water

Ground water flow fluctuates seasonally. Limited data suggests that ground water flows west-northwest (WNW) during the growing season and flows north during the non-growing season. The facility's most recent application reports depth to ground water from monitoring wells "located near the land application units" varying from 5 to 8 foot depths.

4.4 Surface Water Considerations

The Dry Bed Canal runs along the southern and eastern perimeter of the facility. Although the facility applied for a NPDES permit in 1986, it has not received the permit, nor has the facility discharged to the canal. The Dry Bed Canal flows into the Snake River during the growing season, and holds no flow during the non-growing season.

The facility lies outside of the 25 and 50 year flood plain, but the 100 year flood plain overlaps part of the lagoon system.

4.5 Buffer Zones and Disinfection Level

The facility reports the following buffer zones:

- greater than ¼ mile to any public or private drinking water supply sources;
- greater than ¼ mile to any surface water other than the Dry Bed Canal and several irrigation canals;
- greater than 50 feet to any surface water;
- greater than 1 mile to any springs;
- greater than ¼ mile to any public roads, dwellings, or private or public gathering places;
- greater than 1000 feet to any inhabited dwelling; and,
- greater than 300 feet to any publicly accessible area.

A three wire pasture fence exists around the land application units and is posted in each corner and every 500 feet along the perimeter with "Sewage Effluent Application – Keep Out".

Given the above conditions, the facility must disinfect to a minimum level of 230 coliform bacteria organisms per 100 mL (Class D effluent and buffer zone scenario F).

5.0 Historic and Proposed Site Loading, Projected Environmental Impacts, and Related Permit Recommendations

5.1 Wastewater Quality and Flow

The Menan wastewater treatment facility has a design average influent flow of 0.229 million gallons (MG) per day and 72.19 MG per year. Although metered influent flow data for the facility does not exist, the 2003 Annual Report used lift station power consumption to estimate years 2001, 2002, and 2003 annual flows at 78.4 MG, 58.8 MG, and 61.6 MG, respectively. Alternatively, expected influent flow is 101,500 gallons per day and 37 MG per year based on current facility service to one fresh pack potato processing plant and a population of over 765

persons (1997 population estimate); assumptions are 25,000 gallons per day for the fresh pack plant and 100 gallons per capita day. The discrepancy between estimated and expected inflow volumes will be resolved by the permit renewal requirement for influent quantity metering.

Regardless of the facility's treatment capacity, Menan is approaching its lagoon wastewater storage capacity of 8.7 MG, and is experiencing minimum freeboard on storage cells during the winter.

Influent quality has not been analyzed. Design criteria included 316 pounds per day of BOD influent and 316 pounds per day of suspended solids influent (equal to an equivalent population of 1580 at 0.2 lb BOD and 0.2 lb SS per capita day). These values may not reflect current wastewater quality, as two of the three potato processing plants which were originally included in the design are no longer operating, and design criteria allowed for higher BOD and suspended solids associated with the processing plants' effluent.

The facility utilizes chlorine gas disinfection but plans to change to a liquid chlorine system, and will submit plans and specifications to the DEQ before implementing the change.

5.2 Loading Rates – General

The 2003 annual report estimated 37.6 MG of land applied wastewater, using a mass balance based on inflow, seepage, evaporation, and precipitation. A totalizing meter recorded the 2004 land applied volume at 12.35 MG.

It is conceivable, based on the actual metered volume, that the facility has overestimated loading rates in the past. Therefore, the 2004 metered effluent application of 12.35 MG – applied to 44.4 acres – will be used in this analysis.

Finally, hydraulic and constituent loading rates at the Menan facility are well below guideline loading rates; therefore, monitoring at the site may be reduced in the future if several years of data conclude that environmental impacts are negligible.

Parameter	Loading		Sampled
	Recommended	Estimated	
Wastewater loading rate	Less than crop uptake	Approximately 25% of alfalfa uptake.	
Nitrogen	< 150% of crop uptake.	Less than 7% of crop uptake.	
COD	< 50 lb/ac*d	0.27 lb/ac*d	
Sodium	SAR < 10		SAR 0.3 to 5
Phosphorus	< 125% of crop uptake.	Approximately 25% of alfalfa uptake.	

5.3 Wastewater Constituent Loading

Constituent loading due to 12.35 million gallons of land applied wastewater are listed below. The concentrations used are actual 2004 sampling results.

Specie	Concentration	Loading	Recommended Limit
Nitrogen	3.3 mg/L	8 lb/ac	150% of crop uptake: - 147 lb/ac for alfalfa; - 117 lb/ac for barley.
Phosphorus	1.57 mg/L	4 lb/ac	15 – 20 lb/ac
COD	25 mg/L	0.27 lb/ac*d	50 lb/ac*d
TDS	310 mg/L	719 lb/ac	< 4000 lb/ac

5.4 Crop Nitrogen Requirements

Crop nitrogen requirements listed below are based on 2004 crop yield for alfalfa, and 1995 crop yield for barley. Note that the crop nitrogen requirements are well above the nitrogen supplied by the wastewater.

Crop	Yield	Nitrogen Uptake	
Alfalfa	1.95 tons/ac	50 lb/ton	97 lb/ac
Barley	90 bu/ac	0.87 lb/bu	78 lb/ac

5.5 Hydraulic Loading

5.5.1 NGS Hydraulic Loading

The Menan facility shall not land apply in the non-growing season.

5.5.2 GS Hydraulic Loading

Crop water requirements (irrigation water requirements, or IWR) are shown below for the facility expansion to 44 acres, using an irrigation efficiency of 75 percent. Note that the crops require more water than can be supplied by the facility wastewater volume of 12.35 million gallons. Supplemental irrigation water is available from the Long Island Canal.

Crop	Water Use per Acre								Crop Total Water Needs
	April	May	June	July	Aug	Sep	Oct	Total	
Alfalfa									
IWR:									
in./d	0.09	0.25	0.29	0.32	0.23	0.14	0.03		
gal/d	2,380	6,884	7,939	8,808	6,257	3,720	884		
gal	71,408	213,410	238,168	273,059	193,969	111,601	27,394	1,129,010	50,128,048
in.	2.63	7.86	8.77	10.06	7.14	4.11	1.01	42	
Barley									
IWR:									
in./d	0.05	0.12	0.33	0.40	0.13				
gal/d	1,311	3,321	8,951	10,790	3,663				
gal	39,338	102,950	268,527	334,476	113,554			858,844	38,132,679
in.	1.45	3.79	9.89	12.32	4.18			32	

5.6 Cropping Plan

The latest cropping plan was submitted in the 2003 application for increased land application acreage. The plan calls for five years of alfalfa, followed by two years of grain. Barley has been the historical grain crop at the facility (1995 – 1997).

6.0 Site Management and related permit recommendations

6.1 Plan of Operation (*Plan*, Operation and Maintenance Plan, or O&M Plan)

The Plan of Operation (*Plan*) shall be updated to reflect changes at the facility which have occurred since the *Plan* was created in 1986.

6.2 Odor Management Plan (Nuisance Odor Plan)

Although odor management is briefly discussed in the existing *Plan*, the procedures should be more extensively reviewed and extracted to stand alone as a separate document.

6.3 Grazing Plan

The Menan facility disinfects to Class D effluent. Grazing is not allowed on Class D effluent (chlorine disinfection to less than 230 organisms per 100 mL) or Class E effluent (no disinfection and/or coliform organisms too numerous to count).

6.4 Waste Solids (Sludge) Management Plan

Although the original *Plan* contains procedures for sludge management, the procedures should be more extensively reviewed, extracted to stand alone as a separate document, and indicate how the requirements of Permit Condition I.5 are met.

6.5 Buffer Zones and Wellhead Protection

The facility appears to comply with buffer zone requirements for Class D effluent (less than 230 coliform organisms per 100 mL). However, the facility should revisit and review any new construction near the facility to verify buffer zone requirements.

The facility appears to have on-site wellheads impacted by land application procedures and/or well construction techniques. The facility shall develop and implement a Wellhead Protection Plan.

6.6 Lagoons: Integrity, Sludge Depths, and Seepage Tests

Sludge depth monitoring and action depths shall be part of the Waste Solids (Sludge) Management Plan.

All lagoons shall be seepage tested every five years to determine liner integrity. The facility is currently in the process of seepage testing the lagoons, and shall complete the seepage tests within one year. In order to comply with Permit Section I.6, each lagoon shall be tested again before the next permit renewal application. The seepage test results shall be included with the permit renewal package at that time.

7.0 Status of current activities & recommended activities for new permit

7.1 Current Activities

There were no activities required by the previous facility permit.

IDAPA 58.01.16.202 *Classification of Public Wastewater Systems* requires that all systems be classified based on indicators of potential health risks. Further, IDAPA 58.01.16.203 *Public Wastewater System Operator Licensure Requirements* requires that each system be under the responsible charge of an operator who holds a valid license equal to or greater than the classification of the system. Finally, IDAPA 58.01.16.203.07 *Land Application Operator Compliance Deadline* requires licensed land application operating personnel by April 15, 2007. The Menan facility is a Class I facility for both wastewater collection and treatment. Operator Amos Williams holds Class I licenses in both collection and treatment, but has not received licensure in land application to date.

7.2 Required Activities

Renewed Permit Section E – *Compliance Schedule for Required Activities* prescribes compliance activities to be completed by the facility, and their respective completion deadlines. The compliance activities are described below, according to the compliance activity number.

CA-066-01: A **Plan of Operation** manual update. The original Plan of Operation (*Plan*), also known as the O&M Manual, was written in June of 1986. The *Plan* needs to be updated to reflect current operations. A *Plan of Operation Checklist (Checklist)* is located in the DEQ Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater, Appendix A12, page A-85.

Note that the *Checklist* contains inclusion requirements for items listed in the permit as compliance activities, and may contain a brief discussion of those documents/activities. Included in the Section E Compliance Activities as well as in the *Checklist* are:

- (Nuisance) Odor Management Plan;
- Runoff Management Plan, with a description of topics to be addressed;
- Seepage rate testing, with a requirement for schedule and procedure.

CA-066-02: An **Odor Management Plan** is required.

CA-066-03: A lagoon **Waste Solids (Sludge) Management Plan** is required.

CA-066-04: A **Runoff Management Plan** is required. The plan requirements are addressed in the permit.

CA-066-05: **Monitoring Wells**. Wells installed at the Menan facility (wells 1, 2, & 3) appear to be inadequately constructed and impacted by their poor construction. Monitoring well 3 shall be replaced. Monitoring wells 4 & 5 shall be constructed as part of the land application expansion, and shall be located on the northwest and southwest corners of the new acreage (Unit 3 or HMU 3). The construction of wells 3, 4 and 5 shall be according to approved well construction standards, and requires DEQ review and approval of well plans and specifications before

construction. Wells 1 & 2 shall be evaluated according to the facility Wellhead Protection Plan, and shall be replaced if they fail to comply with the plan.

CA-066-06: **Seepage tests** are required on all lagoons according to the most recent DEQ procedures. Current DEQ procedure requires seepage testing on all lagoons every five years. See section 6.6 *Lagoons: Integrity, Sludge Depths, and Seepage Tests* of this Staff Analysis for seepage test timeline requirements.

CA-066-07: **Lagoon seepage repair** is required for seepage rates above 0.25 inches per day.

CA-066-08: **Facility maps**, according to the IDAPA Rules, need to be updated and resubmitted to the DEQ. IDAPA 58.01.17, Section 300 – *Permit Requirements and Application* parts, 300.05.e and 300.05.f specify the following map requirements:

- e. A topographic map of the facility site identifying and showing the location and extent of:
 - i. Wastewater inlets, outlets, and storage structures and facilities;
 - ii. Wells, springs, wetlands, and surface waters;
 - iii. Twenty-five (25), fifty (50), and one hundred (100) year flood plains, as available through the Federal Insurance Administration of the Federal Emergency Management Agency;
 - iv. Service roads;
 - v. Natural or man-made features necessary for treatment;
 - vi. Buildings and structures; and
 - vii. Process chemicals and residue storage facilities.

- f. A topographic map which may be separate from or combined with the facility site map, ***extending one quarter (1/4) mile*** beyond the outer limits of the facility site. The map shall identify and show the location and extent of the following:
 - i. Wells, springs, wetlands, and surface waters;
 - ii. Public and private drinking water supply sources and source water assessment areas (public water system protection area information);
 - iii. Public roads; and
 - iv. Dwellings and private and public gathering places.

CA-066-09: A **Wellhead Protection Plan** shall be submitted to the DEQ. The plan shall address protection of on-site monitoring wells from ground water contamination. Existing and future wells must conform to the plan.

CA-066-10: An **influent flow meter** shall be installed which will totalize daily wastewater influent to the facility.

7.3 Permit Section G – Monitoring Requirements

Permit Section G contains monitoring requirements for the facility. Table 7.1 reorganizes the monitoring requirements according to the medium sampled; the table is intended as an organizational aid only. Note that calculation requirements listed in the Permit Section G *Facility Monitoring Table* are not listed in Table 7.1 – only monitoring requirements are listed. See the Permit for exact descriptions of monitoring and calculations required.

Table 7.1: Monitoring Requirements by Medium

Parameter	Daily	Monthly	Bi-monthly	Semi-annually	Annually	Other frequencies
Wastewater – facility influent	Volume				Flow meter calibration	
Wastewater – lagoon effluent	Volume to each HMU	Lab analysis			Flow meter calibration	
Supplemental irrigation water	Volume to each HMU				1. Flow meter calibration; 2. Backflow testing.	
Ground water			April, June, August, October: ground water level.	April and October: lab analysis.		
Soil					October: lab analysis	April of first and last permit years: lab analysis.
Fertilizer					Quantity applied	
Crop						Each harvest: crop data per HMU.

7.4 Permit Section H – Standard Reporting Requirements

Permit Section H lists the facility reporting requirements. Table 7.2 summarizes the Annual Report requirements which are derived from monitoring. Note that the monitoring requirements are listed across the top of the table, and the Annual Report requirements generated from monitoring constitute the body of the table.

Table 7.2: Annual Report Requirements Derived from Monitoring

Parameter	MONITORING REQUIREMENTS				
	Daily	Monthly	Bi-monthly & semi-annually	Annually	Other frequencies
Wastewater – facility influent	Annual total influent volume.			Flow meter calibration date and results.	
Wastewater – lagoon effluent	1. Total volume to each HMU in gal/d, gal/month, gal/yr and in./ac*d, in./ac*month, and in./ac*yr. 2. <i>Calculations (per HMU):</i> - seasonal average COD applied in lb/ac*d; - nitrogen and phosphorus applied in lb/ac*yr.	Lab analysis results		Flow meter calibration date and results.	
Supplemental irrigation water	1. Total applied to each HMU in gal/d, gal/month, gal/yr and in./ac*d, in./ac*month, and in./ac*yr.			1. Flow meter calibration date and results; 2. Backflow testing date and results.	
Ground water			1. Bi-monthly water table depths: - below ground surface; - above mean sea level; - contour maps. 2. April and October lab analysis results.		
Soil				End of growing season lab analysis results.	Permit first and last year lab analysis results.
Fertilizer				Total pounds applied to each HMU/yr. <i>Calculations:</i> - nitrogen and phosphorus applied in lb/ac*yr.	
Crop	1. <i>Per harvest monitoring</i> shall be reported as facility annual totals, as well as totals for each HMU. <ol style="list-style-type: none"> Facility annual totals: <ul style="list-style-type: none"> facility total crop yield; facility total nitrogen, ash, and phosphorus removal. Per HMU totals: <ul style="list-style-type: none"> crop name; total number of cuts (harvests) per year; crop moisture; per harvest crop yield in tons/ac or lb/ac (dry basis); tissue analysis results; per harvest dry basis nitrogen, ash, and phosphorus removal in lb/ac and total pounds. 2. <i>Annual monitoring</i> calculations shall be reported as the volume of irrigation water required for crop growth, in inches/acre and total gallons/HMU for each growing season month.				

Other Annual Report requirements, as stated in the permit, are:

1. The status of compliance activities.
2. An interpretive discussion of monitoring data with particular respect to environmental impacts by the facility. The report should interpret the monitoring data, including the lab analyses, and discuss any environmental impacts revealed by the data.
3. All laboratory reports containing the sample results for Section G *Monitoring Requirements*.

8.0 Conclusions and Recommendations

The DEQ recommends that the City of Menan conduct the new permit required monitoring and report the required data to evaluate system performance, permit compliance, and guarantee that environmental degradation does not occur at the facility.

9.0 Recommendation for Issuance or Denial of Permit

Staff recommends that the attached Municipal Wastewater Reuse Permit be issued. The permit specifies loading limits for nitrogen, COD, NGS and GS hydraulic loading rates, and establishes monitoring requirements to adequately protect public health and the environment.

10.0 References

USDA – “Soil Survey of Jefferson County, Idaho”, United States Department of Agriculture, Soil Conservation Service, December 1979.

R.G. Allen and C.E. Brockway – "Estimating Consumptive Irrigation Requirements for Crops in Idaho" University of Idaho, August, 1983.